FINISH CONTAINING ZINC DUST FOR PROTECTION AGAINST CORROSION

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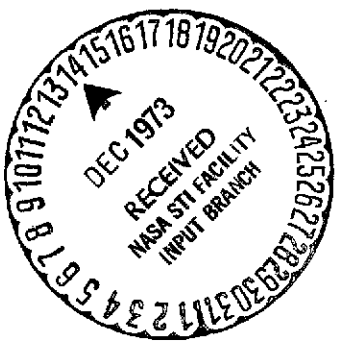
([redacted])

Translation of "Zinkstaubhaltiges Anstrichmittel für den Korrosionsschutz," German patent No. 1,205, 218, issued July 28, 1966, 2 pp.



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16. Abstract

Patent issued for finishes based on alkali silicate solutions to which alkali chromates and organic diamines are added, particularly hexamethylenetetramine, to increase stability from a few days to 1 or 2 weeks. Claims also cover the addition of emulsifiers and/or acetic acid esters. The use of various thickeners and extenders is likewise discussed.

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FINISH CONTAINING ZINC DUST FOR PROTECTION AGAINST CORROSION

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A known method of protection against corrosion from weathering effects and water, particularly sea water, is to apply zinc-dust finishes to metals, particularly iron, making use of alkali silicate as the binder. Such finishes are extremely effective and resistant, but their application in practice is impaired by the fact that the mixtures of alkali silicate solution and zinc dust used to produce the coatings can be worked with for only a short time, since the components react relatively quickly, with the generation of hydrogen. Difficulties are therefore encountered in the storage of such media in closed vessels and in their transport.

Although inhibitors are known which retard the reaction between the alkali silicate solution and zinc dust, it is so far possible to thereby achieve stabilization for up to a maximum of about 3 days. Thus in the case of such finishes which have been stabilized with lead peroxide or sodium persulfate, for example, the generation of hydrogen occurs in about 24 hours. But this is not adequate for practical needs.

It has now been found that anticorrosion finishes containing zinc dust which are based on alkali silicate solutions can, surprisingly, be given improved characteristics, particularly with regard to stability, through the addition of alkali chromate and organic compounds that contain at least two amino groups per molecule. Organic compounds of the above type to be given particular consideration include phenylenediamine, benzidine, guanidine, melamine, or alkylenediamines such as hexamethylenediamine. The addition of hexamethylenetetramine (urotropin) has proven to be particularly advantageous.

As was then found, even small quantities are adequate here -- about 0.1 to 2 wt.% total, referred to the alkali silicate solution used. Quantities to be given preferential consideration are 0.2 to 0.5 wt.%. It is generally desirable to have the alkali chromate component predominate in the inhibitor mixtures, whose individual components do not produce satisfactory effects. Alkali chromates which can be used are sodium or potassium chromate and, if appropriate, the corresponding bichromates.

Finishes of the type described at the beginning which contain additives in accordance with this invention have a practical stability of at least 7 days or so, i.e. no measurable hydrogen generation occurs prior to this time. It is also possible to use extremely fine zinc dust, which would otherwise react with distilled or tap water, generating hydrogen. The use of such a zinc dust is especially desirable for the purpose of manufacturing particularly waterproof finishes.

The alkali chromate and organic diamino compounds can be added to the finishes either in powdered solid form or in solutions, during or after production. They are prepared in the conventional manner by mixing alkali silicate solution and zinc dust. Sodium or potassium silicate solutions can be employed here. In practice, preference will generally be given to the easily accessible water glass solutions with an $Na_2O:SiO_2$ ratio of 1:3.2 to 3.8 and a concentration of about 28 to 42° Baumé. In addition, the finishes can also contain thickening additives such as alginates, methylcellulose and starch at levels of about 0.01 to 0.3 wt.%, referred to total mixture. In many cases it is also of advantage to add emulsifiers in small quantities, say up to 0.5 wt.%, e.g. particularly products of the addition of ethylene oxide to fatty alcohols or fatty acids. The addition of methyl or ethyl acetate -- at

levels of 0.5 wt.%, referred to total mixture -- has proven to be desirable for improving the adhesion of such finishes, particularly on sheet metals which have not been completely de-fatted.

Substances such as kaolin, bentonite and montmorillonite, as well as zinc oxide, can also be added to the finishes as extenders.

Example 1

Extremely fine zinc dust (450 g) is mixed, with stirring, with 100 g water glass solution, 30° Baumé, $Na_2O:SiO_2$ ratio 1:3.79, and to the mixture is added 0.1 g hexamethylenetetramine and 0.4 g potassium chromate, followed by 60 g of a 2% sodium alginate solution.

The finish so obtained has good brushability and, in practical terms, can be kept 2 weeks. A medium of the same composition but without the addition of hexamethylenetetramine and potassium chromate was unusable in just 10 hours.

Example 2

Water glass solution (10 kg, 37/40° Baumé; $Na_2O:SiO_2$ ratio 1:3.3) is mixed, with stirring, with 45 kg extremely fine zinc dust, 25 g hexamethylenetetramine and 45 g sodium chromate, and 100 g emulsifier (addition product of ethylene oxide and higher fatty alcohol) and 100 g ethyl acetate are then worked in.

The mixture has a working time of about 2 weeks. A tightly adhering coat which does not flake off and which is also resistant to sea water is obtained with this product, even on incompletely de-fatted sheet metals.

Example 3

Water glass solution (10 kg, 37/40° Baumé; $Na_2O:SiO_2$ ratio 1:3.3) is mixed, with stirring, with 45 kg extremely fine zinc dust, 25 g hexamethylenediamine and 45 g sodium chromate, and 100 g emulsifier (addition product of ethylene oxide and higher fatty alcohol) and 100 g ethyl acetate are then worked in.

This ready-to-paint mixture is suitable for application to incompletely de-fatted sheet metals. The material has a working time of at least 8 days.

Claims

1. Anticorrosion finish containing zinc dust, based on alkali silicate solutions, characterized by the addition of alkali chromate and organic compounds which contain at least two amino groups per molecule.

2. Finish in accordance with Claim 1, characterized in that the additive consists of an alkali chromate and hexamethylenetetramine in quantities totaling 0.1 to 2 wt.%, preferably 0.2 to 0.5 wt.%, referred to the alkali silicate solution.

3. Finish in accordance with Claims 1 and 2, characterized by the further addition of emulsifiers and/or esters of acetic acid with low-molecular-weight aliphatic alcohols.

References taken into consideration:
British Patents No. 643,512, No. 653,587, No. 658,423;
US Patent No. 2,540,108.